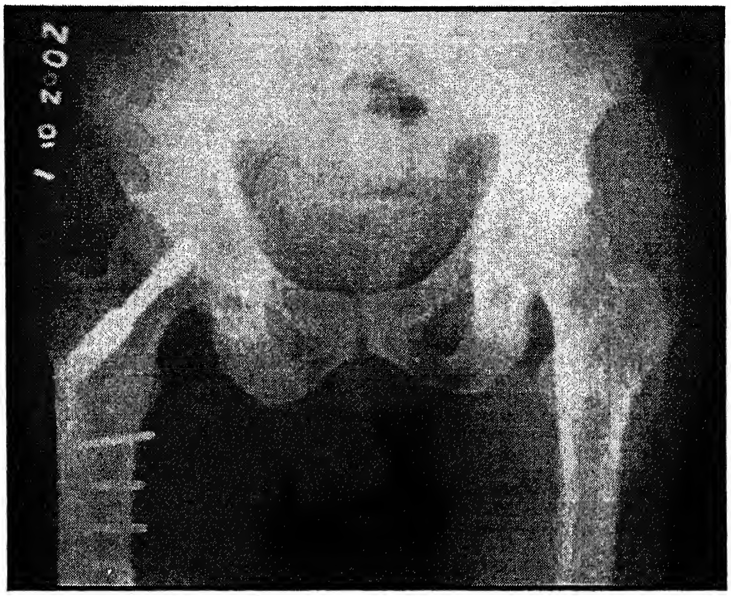
EVALUATION OF ROLE OF DYNAMIC HIP SCREW IN INTERNAL FIXATION OF EXTRA CAPSULAR FRACTURE OF FEMUR



Thesis for Master of Surgery

DEPARTMENT OF ORTHOPAEDICS
M.L.B. MEDICAL COLLEGE,
BUNDELKHAND UNIVERSITY, JHANSI

2004

VINOD PAGRANI

DEPARTMENT OF ORTHOPAEDICS
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BUNDELKHAND UNIVERSITY
JHANSI

CERTIFICATE

This is to certify that research work entitled "Evaluation of role of D.H.S. in Internal Fixation of Extracapsular Fracture of Femur" which is being submitted for M.S. (Orthopaedics) examination 2004 of Bundelkhand University, has been carried out by Dr. Vinod Pagrani, in this Department.

He has fulfilled the conditions of residency as per university regulations.

15/9/03

Prof. P.K. Dabral
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Dr. D.K. Gupta
(M.S.)
Associate Professor
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With deep faith in him, I feel blessed upon by the Almighty, for he enabled me to achieve goals of my life.

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Vinod Pagrani

Dated : 15th Sept 2003

VINOD PAGRANI

CONTENTS

INTRODUCTION

INTRODUCTION

Accidents are unfortunate events of life and fractures are their complication. Increased life expectancy, advancement of industry, increasing number & speed of automobiles, over crowding of roads, lack of traffic sense further adds to the problem.

Extra capsular fracture of the neck femur though, known since time immemorial, still are considered to be crippling injuries, that most affect the elderly & have tremendous impact on both, the health care system and the society in general.

In the modern scientific era, there has been enormous development in the diagnosis and management of the disease and trauma, resulting in fall of death rate. Awareness towards healthy living, hygiene, nutrition and prompt treatment has further helped to reduce the death rate, thus the better understanding of the health care diagnosis and treatment has resulted in increased life expectancy and thus tremendous increase in elderly population.

Hormonal changes are known to occur with increasing age resulting in metabolic changes in bone and osteoporosis which in turn leads to weakness of bones and fracture occur with trivial trauma.

Fractures around hip are one of the common fractures in elderly. The intertrochanteric femoral fractures have been estimated to occur in more than 200,000 patients each year in the United States. (The Indian figures are not available). The incidence being more common in females as compared to males,

Early authors placed most of the emphasis on the intra-capsular femoral neck fractures, and paid relatively little attention to extra-capsular femoral neck fractures, because these injuries usually healed regardless of the mode of treatment as it occurs through the cancellous bone which has excellent blood supply.

Therefore the treatment so far has been mainly conservative like Buck's traction, well leg traction, plaster spica immobilization, Russel balanced traction and skeletal traction through proximal tibia or distal femur, but these are associated with complications like malunion (coxa vara), shortening, Painful hip, stiff knee & above all prolonged recumbency and it's after math like, bed sores, R.T.I, U.T.I deep vein thombosis and behavioral problems. Prolonged stay also causes increased bed occupancy in hospitals which in turn increases financial burden on the health care system, society and nation as a whole, apart from the physical and financial sufferings of the patient and family.

Various operative treatments which were used previously consist of internally fixing the fractures by S. P. nail plate, fixed angle plate, condylar blade plate, with their own limitations, as implants were having static effects.

Now a days dynamic hip screw is being used the device permits continuous telescoping of proximal into distal fragment & maintains the valgus reduction. It also provides compression at the fracture site at the time of surgery & later dynamic compression, by muscle activity (Sisk, 1987). This fixation gives a rigid & stable internal fixation, which leads to early

ambulation, thereby reducing the recumbency period & associated complication.

This study is therefore undertaken to evaluate the results of dynamic Hip screw in extra capsular fracture of femur.

AIMS OF STUDY

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1. To study the etiology and epidemiology of inter-trochanteric fracture of femur.
2. To evaluate the results of open reduction and internal fixation with D.H.S. in treatment of extra capsular fractures of femur.
3. Assessment of complications of D.H.S. in treatment of extra capsular fractures of femur.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Ambrose Pare, the famous French surgeon, recognized the existence of hip fracture more the four hundred years ago; however, Sir Astley Cooper (1827) appears to have been the first to attempt to delineate clearly between intracapsular fracture and other fracture and dislocation about the hip.

Phillip (1867) introduced a technique for longitudinal and lateral traction to be used in femoral neck fractures to eliminate shortening or other deformity.

With the advent of X-ray, Whitman (1902) advocated careful reduction and holding of reduced fractures in spica cast.

Cotton (1911) recommended artificial impaction of fractures fragment by blows from a heavy mallet applied to the padded trochanter before cast application.

Ruth (1921) advocated closed reduction and maintenance of reduction in a "Phillip Splint" for eight weeks and avoidance of weight bearing for six to twelve months after traction.

Wilkie (1927) modified the Whitman method by using bilateral short-leg cast connected by a transverse bar instead of spica cast for fracture immobilization.

Anderson and Childress (1932) described well-leg traction in treatment of intertrochantric fractures of the femur.

Murray (1949) claimed that trochanteric fractures treated conservatively by skin traction or Steinmann pin skeletal traction with Hamilton Russel traction has better results than any operation and that mortality is lower.

Clawson (1957) used longitudinal skeletal traction in certain unstable fractures. He stressed need to adjust rotation of

the limb, to use serial x-ray to evaluate fracture reduction and to encourage a daily programme of exercises.

Horowitz (1960) reported a mortality rate of 34.6% for trochanteric fractures treated by traction and 17.5% for those treated by internal fixation.

Shaftan (1967) suggested early mobilization to treat intertrochanteric fractures. The patient is mobilized immediately, just as if they had been treated operatively. They are not treated in traction but are given analgesics and placed in chair daily and fracture itself is essentially ignored.

Aufranc and associates (1967) recommended skeletal traction in balanced suspension for ten to twelve weeks. The leg is kept in slight abduction which allows easier reduction and maintenance of normal neck-shaft angle. The patient is then mobilized and allowed partial weight bearing until fracture healing is solid. They noted that Partial weight bearing may be required for six months before good fracture stability is obtained, and that varus displacement could occur as late as three to four months after fracture.

Freidenberg and colleagues (1972) suggested that patients with terminal illness, patient with old fracture and non ambulatory patients who are comfortable with the fracture should receive conservative treatment.

Lyon and Nevins (1977) reported that non surgical treatment in nursing home is safer and far less expensive for intertrochantric fractures in patients who have little or no chance to walk. They recommended frequent turning, avoidance of catheterization and traction, plus nursing attention and chair transfer when pain subsides, usually in four to six weeks. These

authors believe that only indication for surgical repair of a hip fracture in an institutionalized patient is a reasonable chance to regain ambulatory status.

Hornby and associates (1989) compared operative and conservative treatment for intertrochantric fractures of the femur in elderly patients. Operative treatment produced better anatomical results and shorter hospital stays than did conservative treatment.

INTERNAL FIXATION IN HIP FRACTURES

The first to have nailed a hip fracture appears to have been Von Langenbeck in 1850.

Konig (1875) and Nicolaysen (1897) advocated the use of nails in serious cases. Davis (1908) reported the use of ordinary wood screws for fixation of the femoral neck fractures. Similar wood screws for internal fixation were used by Da Costa in 1907, Delbet in 1919 and Martin and King in 1920.

Hey Groves (1916), designed a quadriflange nail to obtain better fixation, but it was made of unsatisfactory material.

Smith-Peterson (1931), using a triflange nail, reported a series of open nailing in which he advocated reduction, impaction and internal fixation.

Johansson (1932) simplified Smith Paterson technique by cannulating the S.P nail. Thornton (1937), added side plate to the triflange nail. This ultimately led to the development of solid nail plate by Jewett in 1941 and Holt in 1963.

DYNAMIC HIP SCREW

A screw that provided dynamic compression at the fracture site was introduced by Virgin and Mac Ausland in 1945.

Schumpelick and Jantzen (1955), Pugh (1955), Badgley (1960), Massie (1962), Clawson (1964), introduced telescoping nails or screws which allows gradual impaction at the fracture site.

Clawson (1964), pointed out that to ensure impaction, the barrel of the dynamic hip screw device must not cross the fracture site. There also must be enough room for the implant to collapse before screw impinges on the barrel because, when such impingement occurs, the device acts as a fixed-angle plate. Failure of hip screw to slide, also results in the implant functioning as a fixed- angle plate.

The low incidence of complications found after anatomical nailing of unstable fractures by Friedenberg and collegues (1972), Sahistrand. T. (1974), and Mulholland and Gunn (1972) emphasizes the value of Sliding Compression hip screw in the treatment of intertrochantric fractures.

Laros and Moore (1974) emphasized that although dynamic hip screw devices being more technically demanding but had fewer complications of fracture and non union than with fixed-angle devices.

Clawson and Ecker (1975), noted that the unstable intertrochantric fractures treated with dynamic hip screw underwent shortening and medial displacement, but the fracture went onto prompt union. Although shortening of upto 1 cm occurred, the head did not fall into varus displacement and the

fixation device did not cut through the head to damage the acetabulam.

Jacobs and coworkers (1976) demonstrated an increased incidence of joint penetration with fixed nail plate devices as compared with sliding compression screw.

Kyle and colleagues (1980) suggested that the potential of jamming or failure of hip screw to slide is decreased by maximum engagement (more than 2.5 cm) of the screw in the barrel and by the use of a 150^0, screw plate instead of 130^0 implant. In devices with angles lower than 155^0, greater forces perpendicular to the axis of the sliding screw are present which act to jam or bend the device, which prevents impaction.

Jensen and colleagues (1980) demonstrated that in stable intertrochanteric fractures, choice of implant did not affect results, but in unstable fractures, the sliding hip screw was the most suitable implant.

Jacobs and colleagues (1980) demonstrated that dynamic hip screw allows an unstable intertrochanteric fracture to impact and thereby seek its own stability. Due to sliding of dynamic hip screw with settling of unstable fractures, the lever arm acting on nail plate junction shortens, thereby reduced force on the implant.

Jenson (1981) suggested that controlled collapse of sliding compression hip screw improves the weight bearing capacity of implant through reduction of moment arm.

Wolfgang and coworkers (1982), noted that unstable intertrochanteric fracture treated with dynamic hip screw without obtaining bony stability has a 21% rate of mechanical failure. This rate was reduced to 10% when bony stability was

obtained before the dynamic hip screw was used. They emphasized that failure of lag screw to telescope also can occur as the result of impingement of the sleeve of the side plate on the base of the proximal fragment. These authors also reported metal failure by side plate or lag screw fracture in patients in whom the fracture reduction was considered unsatisfactory. Hence, they concluded that a dynamic compression screw device must be sufficiently strong to withstand physiologic loading, or results will be no better than those of a rigid device.

Rao and coworkers (1983), reported that fixation with dynamic hip screw in unstable fractures resulted in 90% of their fractures moving into a medially displaced position after surgery, indicating that there was no advantage to a primary medial displacement osteotomy.

Heyse-Moore and associates (1983) concluded that sliding compression hip screw is superior to the Jewett nail in the treatment of intertrochanteric fractures of the femur.

Hopkins and coworkers (1989) suggested that there was no advantage to medial displacement osteotomy over anatomical nailing when a dynamic hip screw was used in unstable intertrochantric fractures.

Chang and coworkers (1987) also compared the stability of anatomical reduction versus medial displacement osteotomy in unstable intertrochanteric fractures. They reported that an anatomical reduction of a four part intertrochanteric fractures internally fixed with a dynamic hip screw provided significantly higher compression across the calcar region and lower tensile strength on the plate than is obtained by medial displacement osteotomy.

Larsson and coworkers (1988), report that bending of a dynamic hip screw obstructs telescoping so that dynamic device is converted to a rigid system that does not allow impaction.

Kyle (1988) recommended using the highest- angle nail plate device that allows center head placement of the screw.

Des Jardines and coworkers (1993) found that postoperative complications and early mortality rates to be the same in unstable intertrochanteric fractures treated by anatomical fixation with D.H.S. & those treated by medial displacement osteotomy. In addition, operating time and blood loss were greater in the osteotomy group. These authors concluded that there is no need for medial displacement osteotomy in unstable intertrochantric fractures treated with a dynamic hip screw.

Yoshmini and coworkers (1993), report that high nail plate angle and longer screw barrel engagement have no correlation with ease of sliding, even in unstable fractures. These authors found quality of reduction and fracture stability to be the main factors related to screw sliding.

Spivak and associates (1993) discussed four modes of failure of the sliding screw in hip fracture fixation.

1. Cutting out of the compression screw from the femoral head.
2. Pulling off the side plate from the femoral shaft.
3. Disengagement of the sliding compression hip screw from the barrel.
4. Failure of the hip screw.

They reported that all screw failures are related to non-union of the original fractures or the development of a second fracture in the region spanned by the sliding screw.

Gundle R, Gargan. M.F., Simpson. A.H. (1995) concluded for the fixation of unstable inter-trochanteric fractures that the most important factor affecting the load borne by the fracture fragment was the amount of slide available within the device, and that affecting the load carried by device was the position of the screw in the femoral head. For the fracture fixed with device allowing less than 10 mm of slide and those with superior screw position, the risk of failure was increased by factor of 3.2 and 5.9 respectively.

Schick C.H et al (1996) recommended the DHS for stable and Gamma nail for unstable trochanteric fractures. Wu Cc et al (1996) did biomechanical analysis of location of lag screw and concluded that most adequate location of lag screw of DHS is inferior in frontal plane and central in coronal plane.

David A. et al (1996) recommended the use of connectable buttress plate with sliding hip screw for highly unstable fracture of type A3.

Mohan R, Karthikeyan. R, Sonanis S.V, (2000) concluded that rotational torque in the sagital plane imparted during screw insertion can lead to a potentially unstable construct in left-sided D.H.S. fixations when compared to the right-sided ones. This unstable fixation constructs manifests as an anterior spike of the proximal fragment in left-sided fixations due to clockwise torque.

Dujardin F.H. & others (2001) compared between dynamic hip screw and mini-invasive static nail in fractures of the

trochanteric area and found the advantages of mini-invasive technique over D.H.S.

INTRAMEDULLARY DEVICES

ENDER'S NAIL

Ender (1970), reported use of multiple flexible condylocephalic nails that were introduced through the distal femur for the stabilization of the intertrochanteric fractures without opening the fracture site

Chapman and associates (1981) reported complications of Ender nailing.

1. Nail backing out of the medullary canal.
2. Perforation of the nails through the femoral head.
3. Rotation deformity at the fracture site.

Sherk and Foster (1985), reported high incidence of varus deformity and knee pain caused by distal migration of the Ender pins in intertrochanteric fractures.

Nungu and colleagues (1991), reported complications and reoperation rates after treatment of intertrochanteric fractures with the Ender nails twice as high as those in patients treated with sliding compression hip screws.

Comparing Ender nails and a sliding compression hip screw for intertrochanteric fractures, Barrios and associates (1992), reported that quality of reduction, not the type of device or the stability of fracture, are the most important factor in determining results in these patients.

HARRIS NAIL

Harris (1980) designed a intramedullary device to prevent external rotation deformity and distal nail migration noted with Ender's nail.

Sherk and Foster (1985), compared use of Harris condylocephalic nail with that of a sliding compression hip screw in the treatment of intertrochanteric fractures. There was a 51% loss of rigid fixation in patients with the condylocephalic nail, and in these patients deformity developed. In contrast there was no failure of fixation in patients treated with sliding compression hip screw. The authors concluded that sliding compression hip screw is better implant for these fractures.

GAMMA NAIL

Bridle and coworkers (1991) compared the dynamic hip compression screw with the Gamma nail in hundred intertrochanteric fractures of the proximal femur.

They reported the occurrence of four fractures close to the Gamma nail during the post operative period.

They recommended the use of the Gamma nails for intertrochanteric fractures with the sub trochanteric extension and for intertrochanteric fractures with reverse obliquity.

Lindsey and colleagues (1991) concluded that the distal screw holes in the Gamma nail were stress riser. They recommended using the Gamma nail only to increase stability in unstable fractures.

Leung and colleagues (1992) compared the use of the Gamma nail and dynamic hip screw for treatment of intertrochanteric fractures. They found that the Gamma nail was

associated with shorter operative time, smaller incision, less bloss loss and a quicker return to full weight bearing. Although there was no difference in mortality at 6 months, there were more intraoperative complications with the Gamma nail. Two patients of the one hundred thirteen patients in the study suffered a fracture below the tip of the nail. No such fracture was reported with the use of the dynamic hip screw.

Radford and coworkers (1993) compared the Gamma nail and dynamic hip screw. They reported high incidence of femoral shaft fractures with use of the Gamma nail. According to the authors, the femoral shaft fractures resulted from a consistent mismatch between shape of nail and the proximal femur.

Because of high rate of femoral shaft fractures, they did not recommend the use of the Gamma nail in the treatment of intertrochanteric fractures.

Goldhagen and associates (1994), in a comparative study of compression hip screw and the Gamma nail, demonstrated similar clinical results in two treatment groups.

Intramedullary methods of therapy for intertrochanteric fractures require extensive operative experience with the techniques and expensive operative equipment, including image intensification. The high incidence of complications reported with their use has resulted in loss of popularity of these devices.

PROSTHETIC HEMIARTHROPLASTY

Rosenfeld and colleagues (1973) reported the use of prosthetic replacement for intertrochanteric fractures of the femur in debilitated patients.

Stern and Goldstein (1977) also reported successful use of Lienbach prosthesis in selected group of intertrochanteric fractures.

Pinder and associates (1981) and Heiman (1982), described the use of a Leinbach type femoral head-neck prosthesis in complex intertrochanteric fractures with excellent clinical results and a prompt return to preoperative status.

Stern and Angerman (1987) reported quicker restroration of function and shorter hospitalization for patients with comminuted intertrochanteric fractures treated with Leinbach prosthesis as compared with those treated by open reduction and internal fixation.

Green and coworker (1987) reported the use of bipolar prosthetic replacement for unstable intertrochanteric fractures in elderly patients.

Haentjens and associates (1989), reported primary bipolar arthroplasty in patients more than seventy five years of age with unstable intertrochanteric fractures.

Broos and colleagues (1991) suggested that complex multifragment intertrochanteric fractures might be better treated with endoprosthesis primarily.

CLASSIFICATION

According to Jensen, classification system of fractures must serve two functions. First it must relate the possibility of obtaining a primary stable reduction. Second, it must allow surgeon to predict the risk of secondary loss of this fracture reduction after internal fixation.

Boyd and Griffin (1949), presented a classification system based on the ease of obtaining and maintaining fracture reduction. They divided intertrochanteric fractures into four types.

Tronzo (1974) modified Boyd and Griffin classification by dividing their type III fracture into two separate groups thereby creating five fracture types.

Kyle and colleagues (1979) modified Boyd's classification. Evans (1949) presented a simpler classification by dividing fractures into stable and unstable groups.

He further divided unstable fracture into those in which stability could be resorted by anatomical or near anatomical reduction and in those in which anatomical reduction would not create stability.

Jensen found Evans classification to be most accurate system in predicting the possibility of both anatomical reduction and secondary fracture displacement after nailing.

- **Evans Classification :** The main types depending upon direction of fracture line.

Type I Fracture line extends upward and outward from the lesser trochanter.

Type II Fracture line is one of reversed obliquity.

Stability in type I fracture is obtained by anatomical medial cortical reduction.

Type II fracture have tendency towards medial displacement of the femoral haft and, hence retain a degree of instability.

Boyd and Griffin classification

Type I Fracture are non displaced, stable, intertrochanteric fractures without comminuition. These account for 21% intertrochanteric fractures.

Type II Fractures are stable, minimally comminuted, but displaced fractures. These fractures represent 36% of intertrochanteric fractures and, once they are reduced, allow a stable construct.

Type III Fractures have a large posteromedial comminuted area and are unstable. They constitute 28% of intertrochanteric fractures.

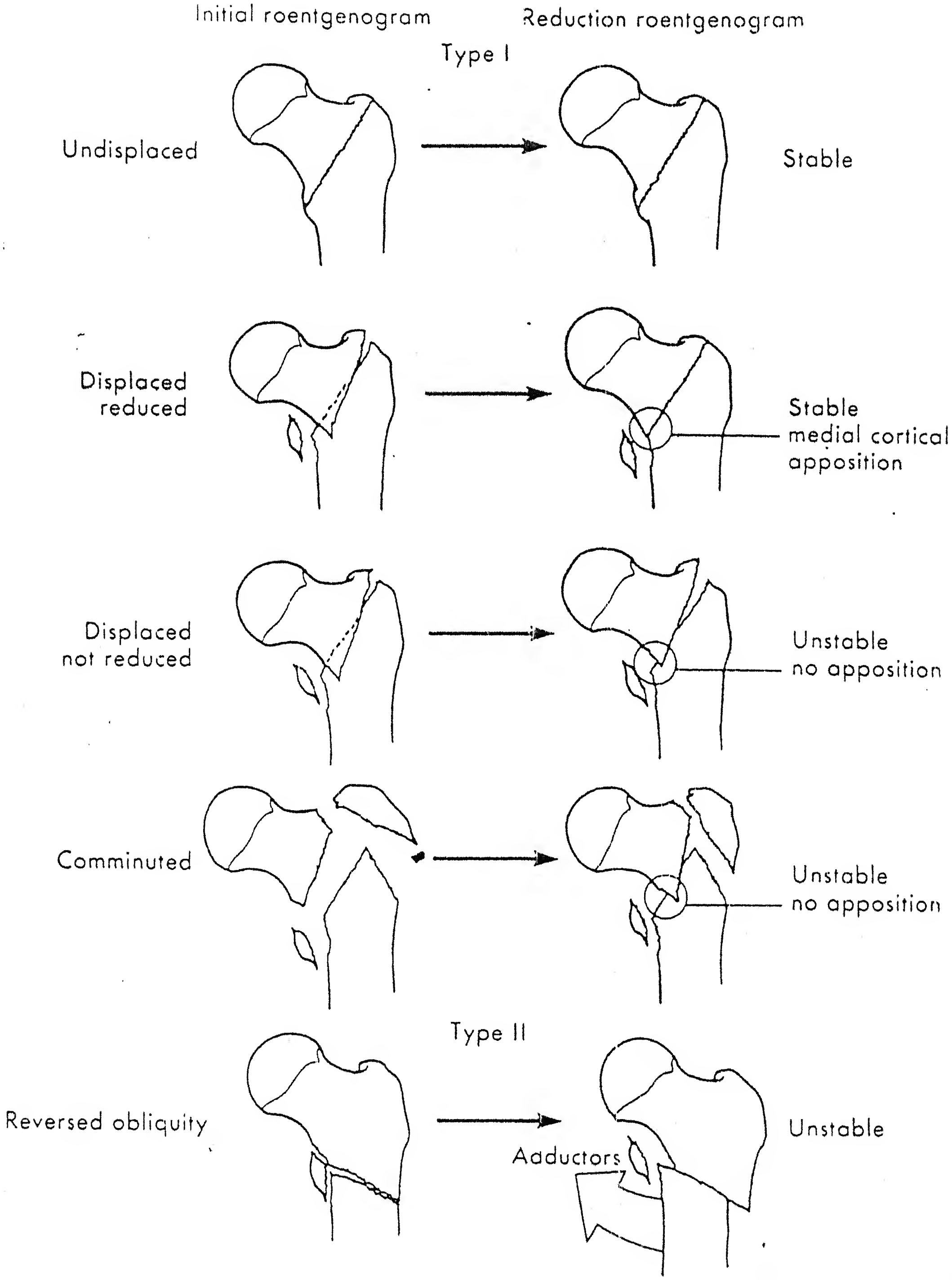
Type IV Fractures consist of intertrochanteric fracture with subtrochanteric component. These make up 15% of intertrochanteric fractures.

A.O. Classification

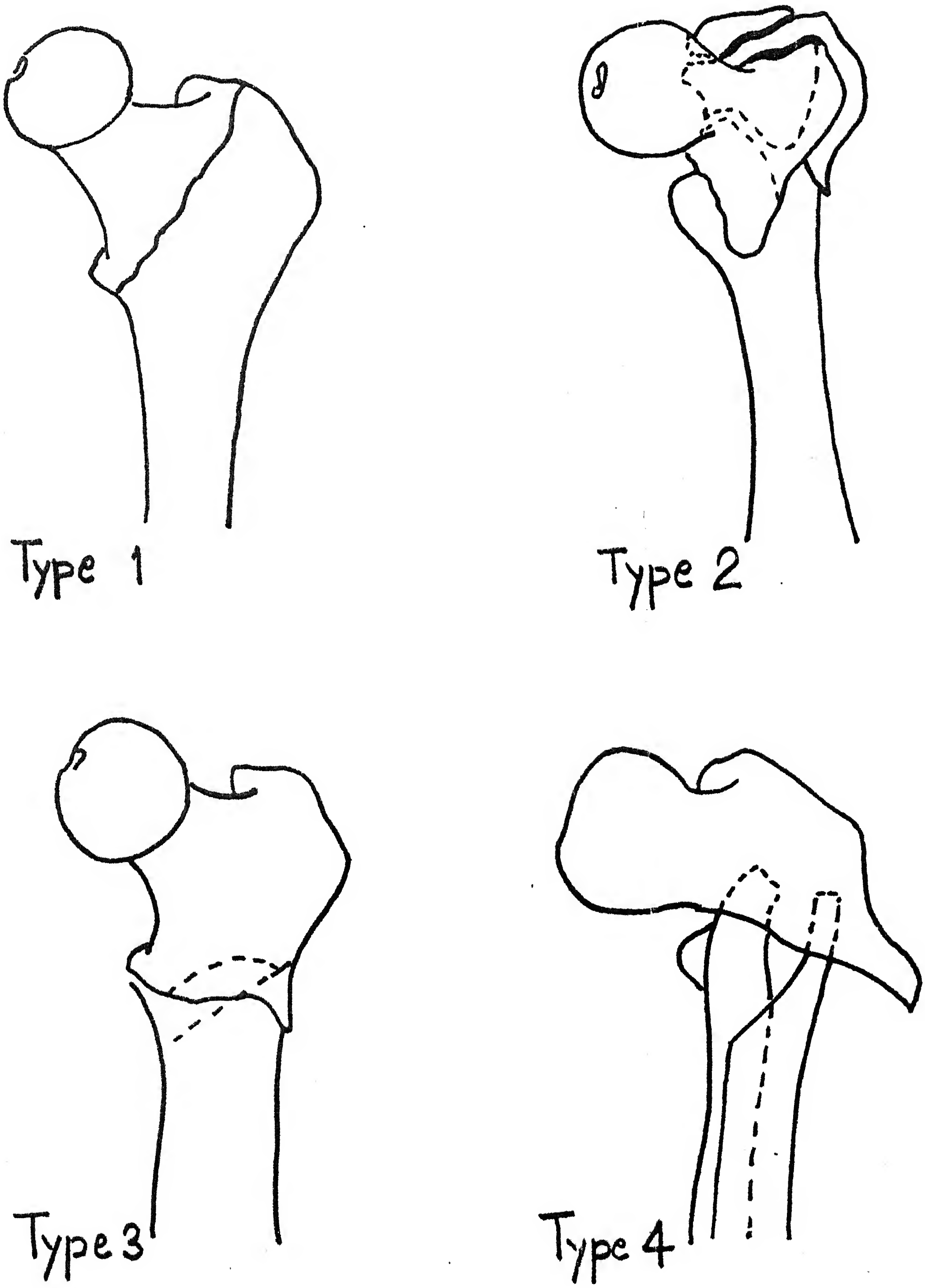
Group A1 – Simple two-part fracture.

Group A2– fracture extends over two or more levels of medial cortex.

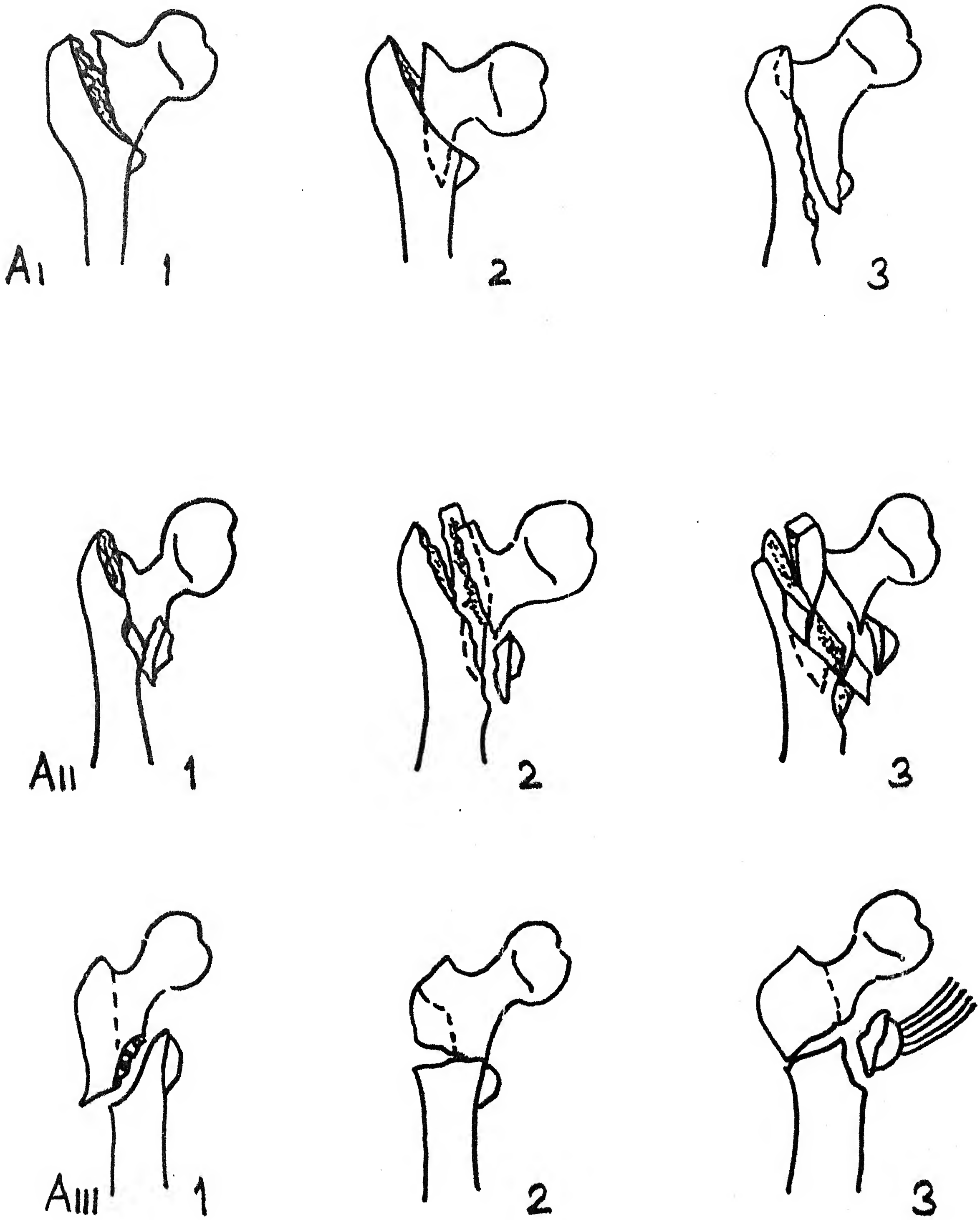
Group A3 – fracture extends through lateral cortex of femur.



EVAN'S CLASSIFICATION



BOYD AND GRIFFIN CLASSIFICATION



AO CLASSIFICATION

MATERIALS & METHODS

MATERIAL AND METHODS

This study was conducted in the Department of Orthopaedics, M.L.B. Medical College Jhansi. The patients for this study were selected from those attending the out patients department of Orthopaedics and from those arriving at emergency department of M.L.B. Medical College, Hospital, Jhansi from Dec 2001 to Aug 2003.

All the patients were subjected to detailed history, clinical examination, necessary radiological and pathological investigations.

CRITERIA FOR SELECTION OF CASES

Criteria for selection was as follows-

- All the cases of unstable inter-trochanteric or sub-trochanteric fractures.
- All the cases of Comminuted inter-trochanteric fractures.
- Stable, oblique and undisplaced intertrochanteric fractures above the age of 60 years.

The young and the elderly patients below the age of 60 years, with undisplaced oblique stable fractures were treated conservatively, to reduce the load on the operation theatre, as this being the government hospital with limited resources.

Fracture were classified as Stable & Unstable types

<u>Stable</u> - Boyd & Griffin type I & II were considered stable types.

<u>Unstable</u> - Boyd & Griffin type III & IV were considered unstable types.

Evaluation of patients

1. **History :** Name, age, sex, side of fracture, mode of injury, duration of injury, associated injury, past history of major illness.

2. **Clinical Assessment of patients :** general condition of patients, vital signs, examination of cardiovascular system and respiratory system for fitness for anaesthesia.

3. **Local Examination :** Examination of the injured hip, assessment of neurovascular status of distal limb and associated injuries.

4. **Initial Management :** Shock, if present, was managed by intravenous fluid, plasma expander and blood transfusion as required.

   Buck's traction was applied immediately and limb was immobilized on Thomas splint.

   After general condition of patients was stabilized, radiological and routine investigations were carried out.

5. **Radiological Examination :** Antero-posterior view of x-ray pelvis with both hip with both limb in full internal rotation and lateral view of injured hip to assess the type of fracture and bone quality.

6. **Routine Investigation :**

   Hb gm%,

   TLC, DLC, ESR

Urine (R/E), (M/E)

Blood urea

Blood Sugar

Serum Creatinine

ECG and X-Ray chest-PA in relevant cases.

Blood group and cross matching.

INTERNAL FIXATION BY DHS

Implant and Instruments

For internal fixation of Intertrochanteric fractures following instruments were used.

(A) Implants :

1. DHS lag screw.
2. Compression screw.
3. 135^0 DHS barrel plate.
4. 4.5 mm cortical screws.

(B) Special Instruments :

1. Guide wire of 2.5mm diameter
2. Angle guide of 135^0
3. Direct measuring device
4. Traction reamer
5. DHS Tap
6. DHS Wrench
7. Centering sleeve for tap
8. Centering sleeve for D.H.S. wrench
9. Coupling screw for removal
10. Guide shaft

11. Impactor
12. Quick-coupling T-Handle

(C) General Instrument :

1. A.O. clamp
2. Drill
3. 3.2mm drill bit
4. Depth gauge
5. 4.5mm tap with tap sleeve
6. 4.5mm screw driver
7. B.P. handle with surgical blade No.23
8. Bone lever
9. Artery forcep.

Technique

Anaesthesia : Patients were given anaesthesia usually spinal, epidural or general.

Patient Positioning : Patients were positioned supine on fracture table. The uninjured lower extremity was held in wide abduction by a foot plate or boot attached to one of the leg extensions of the fracture table. The injured lower extremity is held by a foot plate or boot attached to the other leg extension of the fracture table.

Draping : The skin over hip was prepared after ten minutes soap scrub and application of the usual antiseptic solutions. The lateral aspects of the hip from the iliac crest to the distal thigh was squared off with towels and drapes.

Reduction Techniques : Closed reduction of the fracture was performed by applying traction to the injured lower extremity in neutral or slight internal rotation and slight abduction. Check the reduction by anteroposterior and lateral roentgenograms, paying special attention to cortical contact medially and posteriorly.

Exposure : Lateral approach to the proximal femur from the greater trochanter extending distally was used. The length of incision depended on length of the implant set.

Insertion of Guide wire

Point of Entry : Point opposite the tip of lesser trochanter, two centimeter distal to vastus lateralis ridge on the lateral surface in the midline of the shaft of the femur.

Angle of Anteversion : Avteversion guide wire was inserted by hand onto the anterior surface of femoral neck till it impacts the flare of head.

Insertion of final guide wire

1. 3.2mm drill bit was used to perforate the lateral cortex at the appropriate site of entry.
2. A 2.5mm threaded tip guide wire (230mm) was inserted through 135^0 angle guide so that it was parallel to the version guide wire in the axial plane.
3. The guide wire was inserted till it reached the sub chondral bone. The position of guide wire was confirmed by an anteroposterior and lateral

roentgenogram. In case this guide wire was not found in the ideal position a 2nd guide wire passed, using the 1st wire as a reference wire in corrected position.

Reaming of Femur

Direct measuring device was used to read-off the depth of wire within the bone. The reamer was set 10mm short of the depth of guide wire within the bone. A quick coupling T-Handle was used for manual reaming. The 'Triple' reamer is designed to accurately and simultaneously ream for the lag screw, the barrel and plate barrel junction. If guide wire was inadvertently pulled out with the reamer, it was reinserted using short centering sleeve and DHS lag screw used in reverse which allowed exact relocation of the central axis of the reamed tract.

Tapping : Tapping was not done in osteoporotic bone, but in young patients tapping was done to avoid excessive torque on the insertion wrench and to minimize the risk of inadvertent malrotation of the femoral head fragment during final seating of screw.

Tap was slide into short centering sleeve and mounted onto the quick coupling T-handle. The completed tap assembly was slide onto the guide wire and used to tap the threads for DHS lag screw.

Insertion of DHS screw

The coupling screw was inserted through the guide shaft and threaded onto the selected DHS screw. The entire assembly was then slided into the insertion wrench. The insertion wrench

was used with long centering sleeve. The DHS screw was inserted upto 5 mark of the insertion wrench. The T-handle of wrench was parallel to the femoral shaft at the end of screw insertion. The guide wire was then withdrawn by turning it anticlockwise.

Insertion of barrel plate

The insertion wrench was pulled out and the selected barrel plate was slided over the guide shaft onto the lag screw, the coupling screw and guide shaft were then uncoupled and the nylon tipped impactor was used to seat the barrel plate.

Fixation of plate to femur

The barrel plate was then fixed to the femur using 4.5mm cortical screws.

Insertion of compression screw

The compression screw was inserted after the plate was fixed to bone after loosening of the traction. It was tightened against the rim of the barrel plate to achieve compression.

Finally the wound was closed in layers over suction drain. No external splintage was done.

Post operative care

1. The patient was allowed to sit a day or two after surgery and quadriceps setting & knee bending exercise were started for muscle strengthing as per the pain tolerance of patient.

2. Prophyloctic antibiotics were given till sutures were removed.
3. Drain was removed after forty eight hours.
4. Anteroposterior and lateral check x-ray of operated hip was taken to see quality of reduction, neck shaft angle and placement of lag screw and barrel plate.
5. Stitches were removed at twelve to fourteen days.
6. Graduated weight bearing was permitted as per the stability of fixation and educational status of the patient.
7. Full unsupported weight bearing was started after radiological union of fracture.

Follow up : Follow up was done regularly upto six months after surgery. During follow up patients were evaluated clinically and radiologically for assessment of progress of union and complication if any.

All relevant data were collected and tabulated so as to evaluate the final result.

Evaluation of the results

The results were evaluated and graded as excellent, good and poor as per criteria of Kyle (1979).

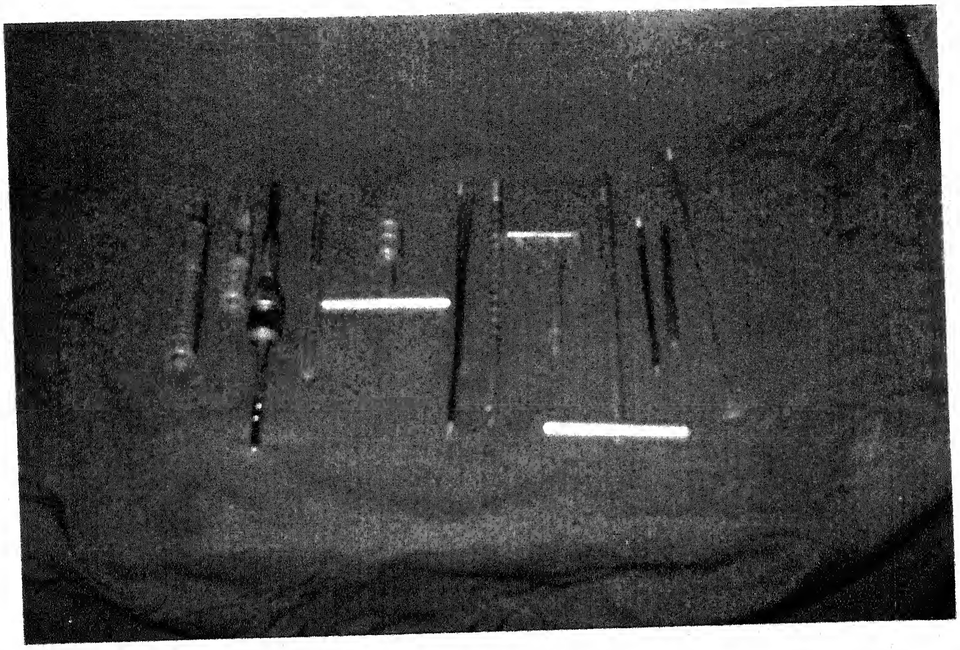
a) Excellent : No pain, minimum limp, normal range of motion, can walk without support, can squat and sit cross legged, no shortening.

b) Good : Occasional mild pain, noticeable limp, acceptable range of motion, can walk with help

of cane, squat and sit cross-legged, shortening less than two cm.

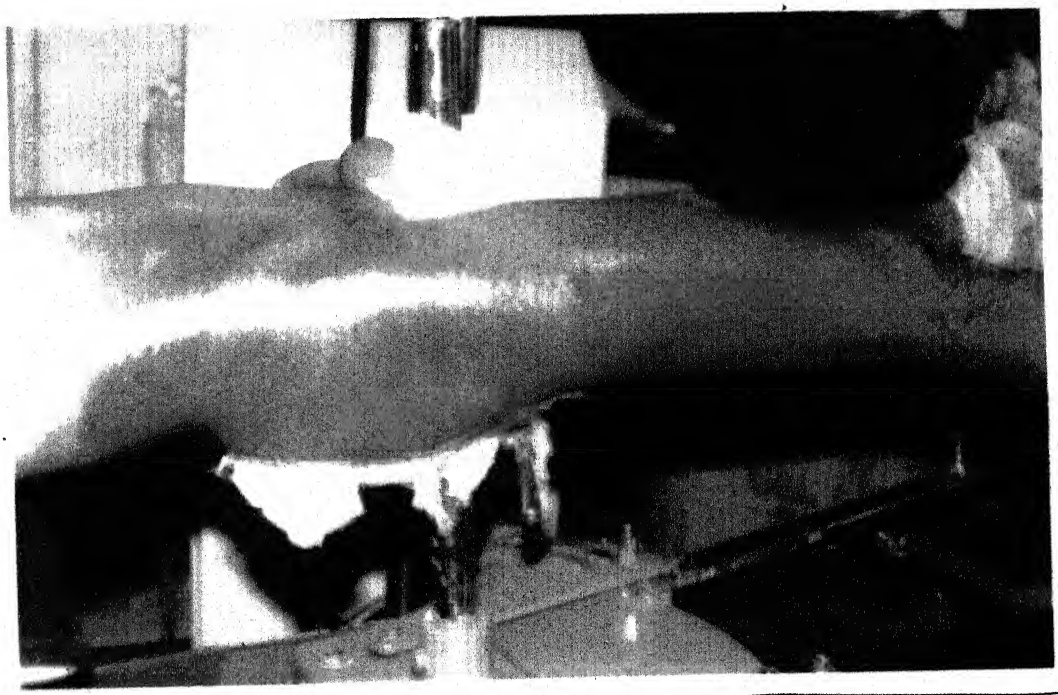
Poor : Moderate pain, marked limp, limited range of motion, can't walk, can't squat and sit cross-legged, shortening more than two cm.

PHOTOGRAPHS

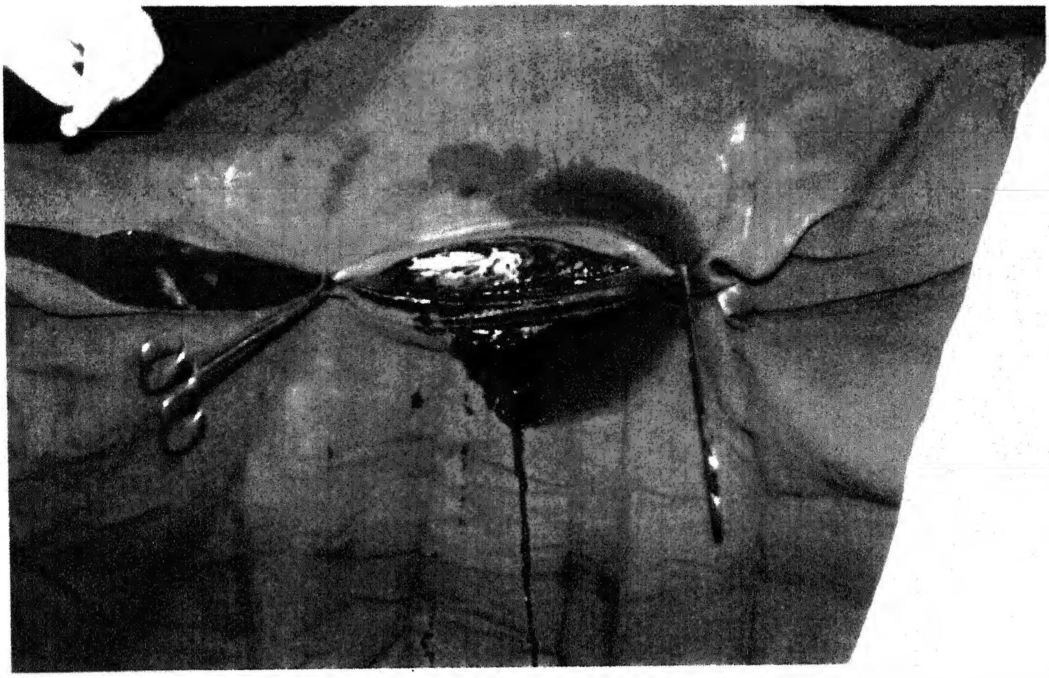


Photograph showing instruments for Dynamic hip screw.

Photograph showing D.H.S. Implant [i e, D.H.S. Plate, Lag Screw, Compression Screw and 4.5 mm Cortical Screw].

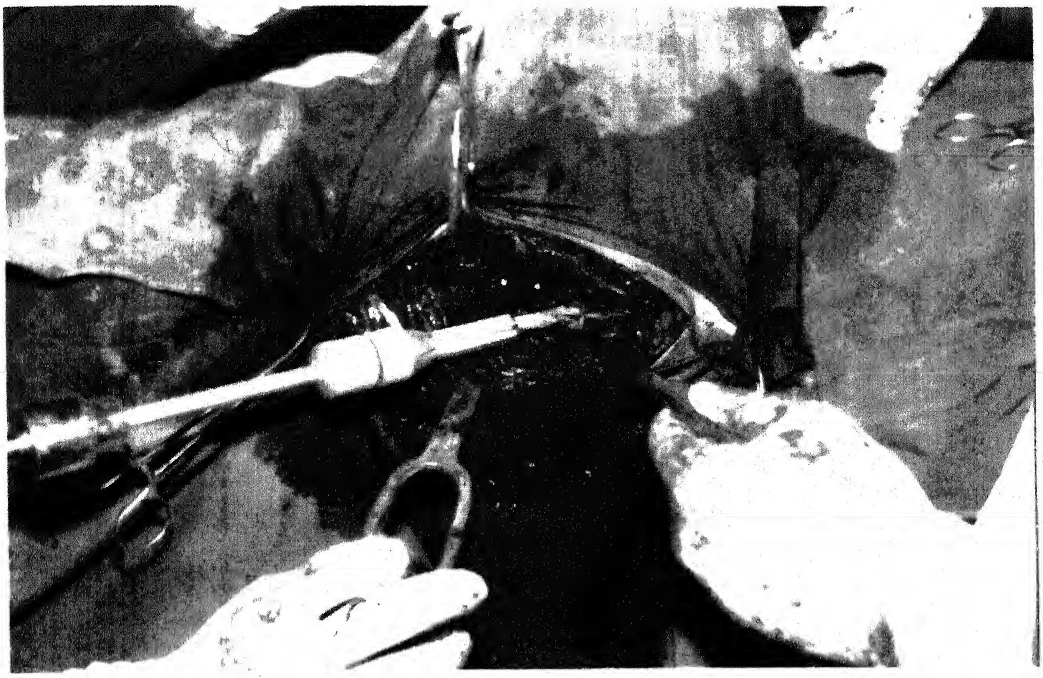


Photograph showing Position of Patient on Fracture Table, Ready for operation.



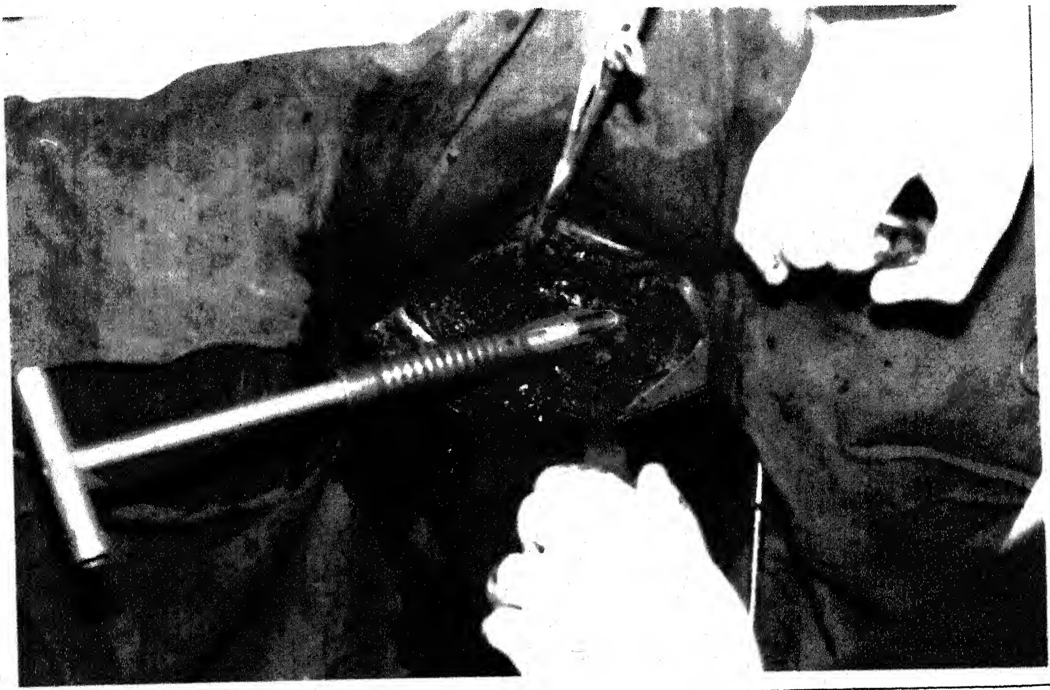
Photograph showing Incision.

Photograph showing Antevertion Guide wire and Guide wire, parallel to each other.

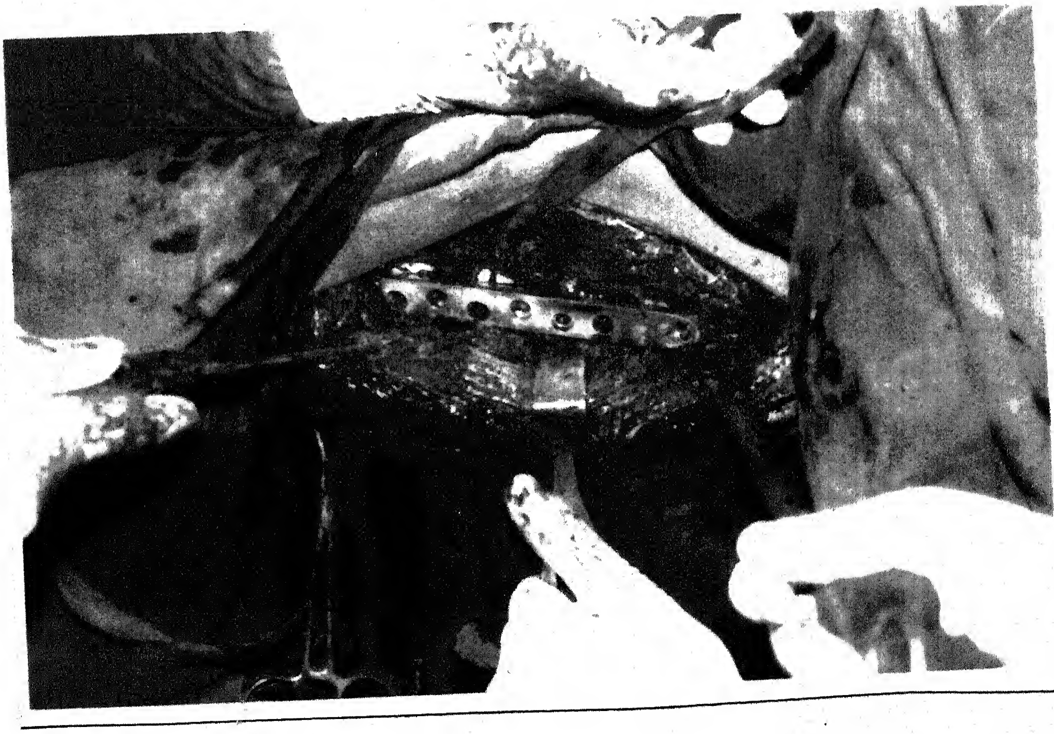


Photograph showing Reaming with Triaction Reamer.

Photograph showing Tapping with D.H.S. Tap.



Photograph showing Insertion of Lag Screw with coupling device.



Photograph showing Application of D.H.S. Plate

OBSERVATIONS

OBSERVATIONS

The present study was conducted in the department of Orthopaedics M.L.B. Medical College Jhansi. This study included twenty patients of intertrochanteric and peritrochanteric fracture of femur treated with open reduction and internal fixation with Dynamic Hip Screw, during Dec. 2001 to May 2003.

Age Incidence

The youngest of the patient was 19 Yrs old boy and the eldest was 95 Yrs old female. Majority of the patients were of the age group between 61 to 80 Yrs. Mean age of these patients was 57.25 Yrs.

Table - I

Distribution of cases according to age

Age	No.	Percentage
0-20	1	5%
21-40	5	25%
41-60	4	20%
61-80	8	40%
81-100	2	10%
Total	20	100%

Sex Incidence

Out of the 20 case 60% (12 patients) were males and 40% (8 patients) were females. Over all male to female ratio was M:F – 3:2.

Table - II

Distribution of cases according to sex

Sex	Number	Percentage
Male	12	60%
Female	8	40%
Total	**20**	**100%**

Side of Limb

Out of the 20 cases 60% (12 patients) had a fracture on right side while 40% (8 patients) had fracture on left side and none of the patient had bilateral involvement.

Table - III

Distribution of cases according to side of limb

Side of Limb	Number	Percentage
Right	12	60%
Left	8	40%
Bilateral	0	0
Total	**20**	**100%**

Mode of Injury

Out of the 20 cases 55% (11 patients) were due to trivial trauma i.e. slip on floor, 35% (7 patients) were due to road

traffic accident and 10% (2 patients) were due to fall from height.

Table - IV

Distribution of cases according to mode of Injury

Mode of Injury	Number	Percentage
1. Slip on floor	10	50%
2. Road traffic accidents	8	40%
3. fall from height	2	10%
Total	**20**	**100%**

Occupation of the patient

Out of the 20 cases 50% (10 pts) were sedentary workers (above the age of 60 Yrs), 30% (6 patients) were heavy workers and 20% (4 patients) were moderate workers.

Table - V

Distribution According to Occupation

Occupation	Number	Percentage
Sedentary worker	10	50%
Moderate worker	4	20%
Heavy worker	6	30%
Total	**20**	**100%**

Pattern of Fracture :

Fracture pattern was classified into two types.

- Stable &

- Unstable

Stable type – Boyd & Griffin type I & II were considered in this group.

Unstable type – Boyd & Griffin type III & IV were considered in this group.

Table – VI

Distribution of cases according to fracture pattern.

Pattern of Fracture	No.	Percentage
Stable	4	20%
Unstable	16	80%
Total	**20**	**100%**

Associated Injuries

Out of the 20 patients 70% (14 patients) had no associated injury, while 20% (4 pts) had associated fracture of some other site and 10% (2 Pts) had lacerations of some part of the body.

Table VII.

Distribution according to associated injuries.

I. Associated Injuries	Number	Percentage
1. Fracture lower end radius.	2	10%
2. Fracture surgical neck humerus.	1	5%
3. Fracture ribs.	1	5%
4. Lacerated wounds	2	10%
II. No Associated Injury	14	70%

Associated Illness

Out of the 20 cases 75% (15 pts.) had no associated illness. 10% (2 pts.) had chronic obstructive pulmonary disease 10% (2 pts) had H.T. & D.M. & rest 5%(1 pat.) was of Hepatitis B (HbS AG +ve).

Table – VIII.

Distribution according to associated illness.

I. Associated Illness	**Number**	**Percentage**
1. Hypertension	1	5%
2. COPD	2	10%
3. Diabetes Mellitus + Hypertension	1	5%
4. Hepatitis B (Hbs Ag +ve)	1	5%
II. No ass. Illness	15	75%
Total	**20**	**100%**

Duration between injury and admission :

Most of the patients were admitted within 24 hrs. of injury i.e. 65% (13 pts) but 25% (5 pts) reported within 1st week but after 24 hrs. of injury & the rest 10% (2 pts) came after one week.

Table – IX

Duration between injury & Admission:

Duration between injury & admission	Number	Percentage
1. Within 24 hrs.	13	65%
2. >24 hrs. but ≤ 1 week	5	25%
3. >1 week but ≤ 2 weeks	1	5%
4. > 2 weeks	1	5%
Total	**20**	**100%**

Duration between injury & operation :

Out of the 20 patients 25% (5% pts) were operated between 0-1 week of injury, 45% (9 pts) between 1-2 weeks of injury, 20% (4 pts) between 2-3 weeks of injury & rest 10% (2 pts) after 3 weeks.

Table – X

Distribution According to Duration between injury & operation :

Time Interval between Injury & Operation (in weeks)	Numbers	Percentages
0-1	5	25%
1-2	9	45%
2-3	4	20%
3-4	1	5%
>4	1	5%
Total	**20**	**100%**

Anaesthetia :

19 patients were operated under spinal anaesthesia & 1 patient under Epidural anaesthesia. None of the patient required general anaesthesia.

Table – XI

Distribution according to Anaesthetia given :

Anaesthesia	**Numbers**	**Percentages**
Spinal	19	95%
Epidural	1	5%
General	0	0%
Total	**20**	**100%**

Duration of Hospital Stay :

In majority of patients 65% (13 pts) the hospital stay was between 15-25 days, in 30% (6 pts) between 26-35 days & rest 5% between 46-55 days. The mean duration of hospital stay was 24.55 days.

Table – XII

Distribution according to Hospital stay :

Duration of Hospital stay (in days)	**Numbers**	**Percentages**
15 - 25	13	65%
26 - 35	6	30%
36 - 45	0	0%
46 - 55	1	5%
Total	**20**	**100%**

Weight bearing : In patients with stable fracture pattern & in those in which medealization of distal fragment was done partial weight bearing was started after two weeks and in rest of the cases after six weeks

Table – XIII

Distribution according to beginning of Partial weight bearing

Partial weight bearing	**Numbers**	**Percentages**
After 2 weeks	6	30%
After 6 weeks	14	70%

Full weight bearing was allowed only after fractures consolidation

Range of Movement of hip : Of the 19 patients left for follow up after six months, 84.25% (16 patients) had normal range of movement of hip 10.5% (2 patients) had near normal range of movement of hip and 5.25% (1 patient) had restricted range of movement of hip.

Table – XIV

Distribution according to Range of Movement of Hip :

Range of movement	**Numbers**	**Percentages**
Normal	16	84.25%
Acceptable (Near normal)	2	10.5%
Limited (Restricted)	1	5.25%
Total	**19**	

Range of movement of knee : All the 19 patients left for follow up after six months had normal range of knee movement.

Shortening : Of the 19 patients left for follow up after six months, 84.25% (16 patients) had no shortening 10.5% (2 patients) had shortening of less than 2 cm and 5.25% (1 patient) had shortening of more than 2 cm.

Table – XV

Distribution of cases according to Shortening:

Shortening	Numbers	Percentages
Less than 2 cm	2	10.5%
More than 2 cm	1	5.25%
No shortening	16	84.25%

Final Evaluation according to Kyle's Criteria (1979)

After 6 months results were evaluated & graded as Excellent, Good and Poor as per Kyle's Criteria (1979).

As one patient was lost to follow up after 3 months, out of the 19 patients left 84.25%, (16 pts) had Excellent results, 10.5% (2 pts) had Good result & only 5.25% (1 pt) had Poor results.

Table – XVI

Evaluation According to Kyle's Criteria (1979)

Result	**Numbers**	**Percentages**
Excellent	16	84.25%
Good	2	10.5%
Poor	1	5.25%
Total	19	100%

Complications :

Only major complication was lag screw cutout (with shortening >2cm) seen in one patient (5.9%). Two patients (10%) had superficial wound infection, one patient (5%) had U.T.I. & the other two (10%) with shortening of less than 2 cm.

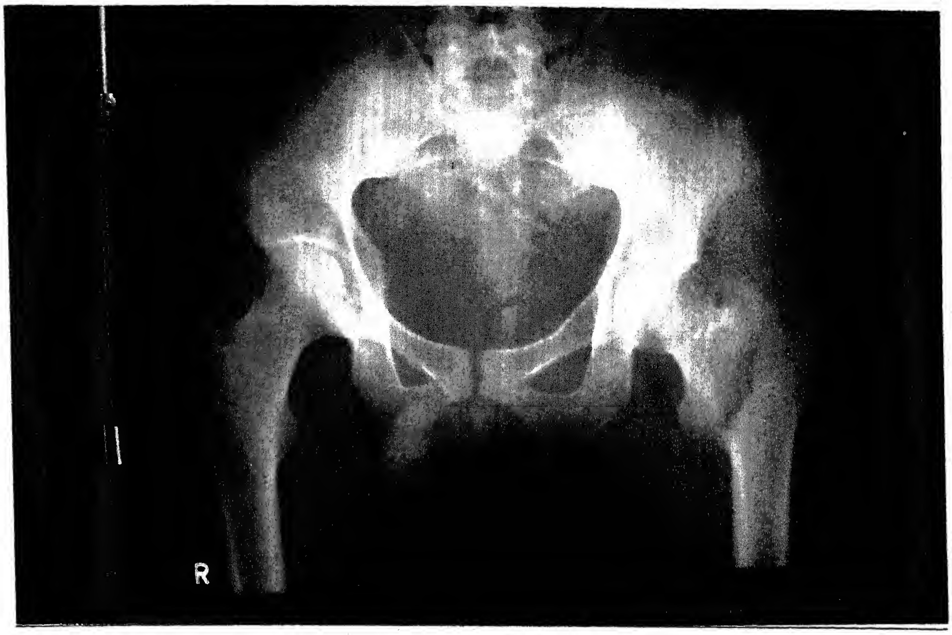
Table – XVII

Complications

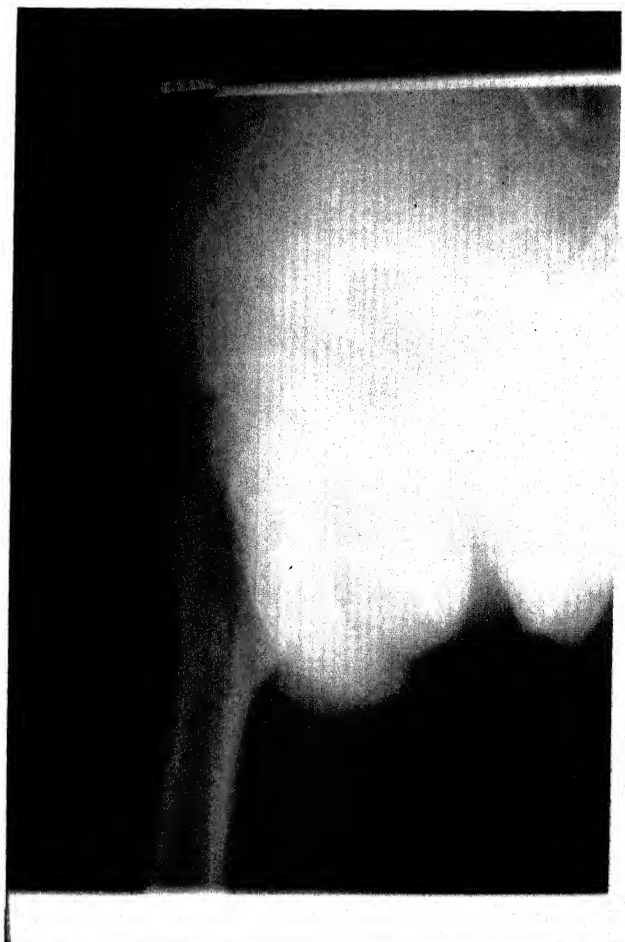
Complications	**Number of complications**	**Percentages**
1. Superficial wound Infection	2	10%
2. Deep wound Infection	-	-
3. Deep vein Thrombosis	-	-
4. Bed sores	-	-
5. Shock	-	-
6. R.T.I.		-
7. U.T.I.	1	5%

9. Shortening <2cm	2	10%
10.Shortening >2cm	1	5%
11. Knee stiffness	0	0%
12. Coxavara	0	0%
13. Non union	0	0
14. Cutting of lag screw	1	5%
15. Implant failure / Bending or breaking of screw.	0	0%

PHOTOGRAPHS



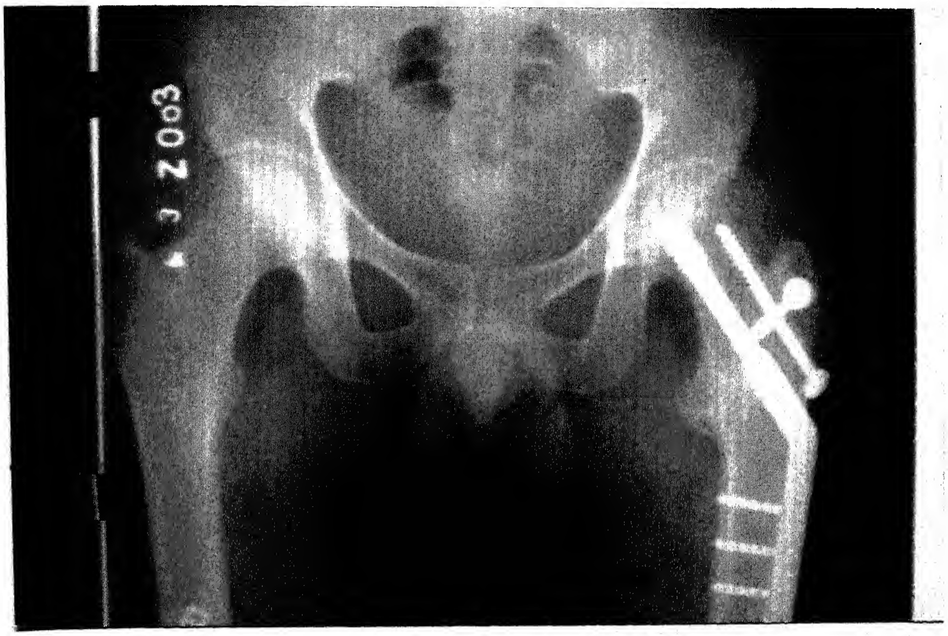
- Anteroposterior View



- Lateral View

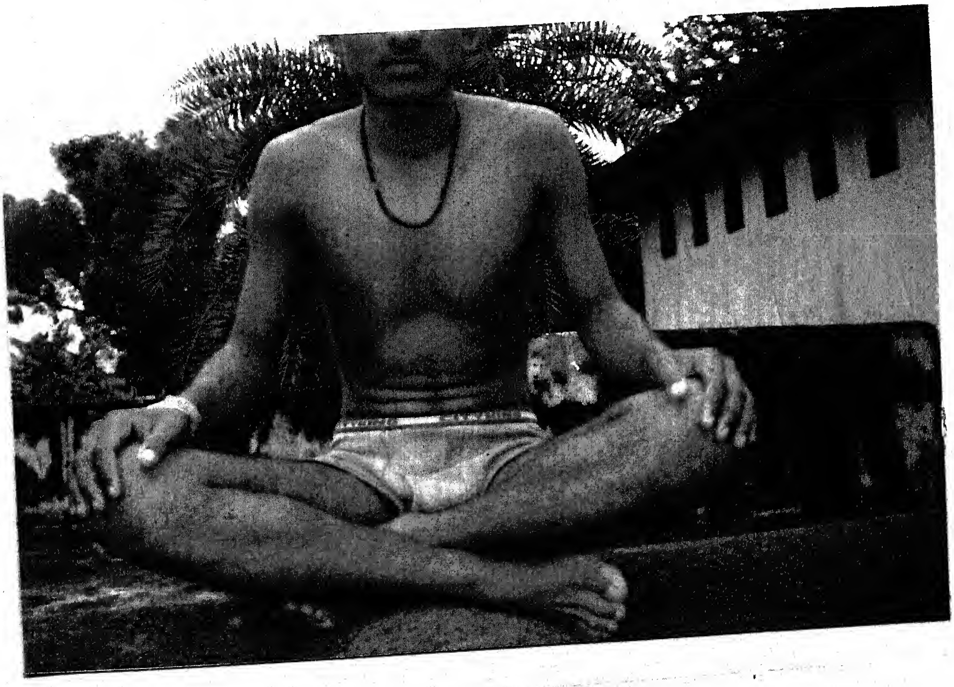
• Anteroposterior View

• Lateral View



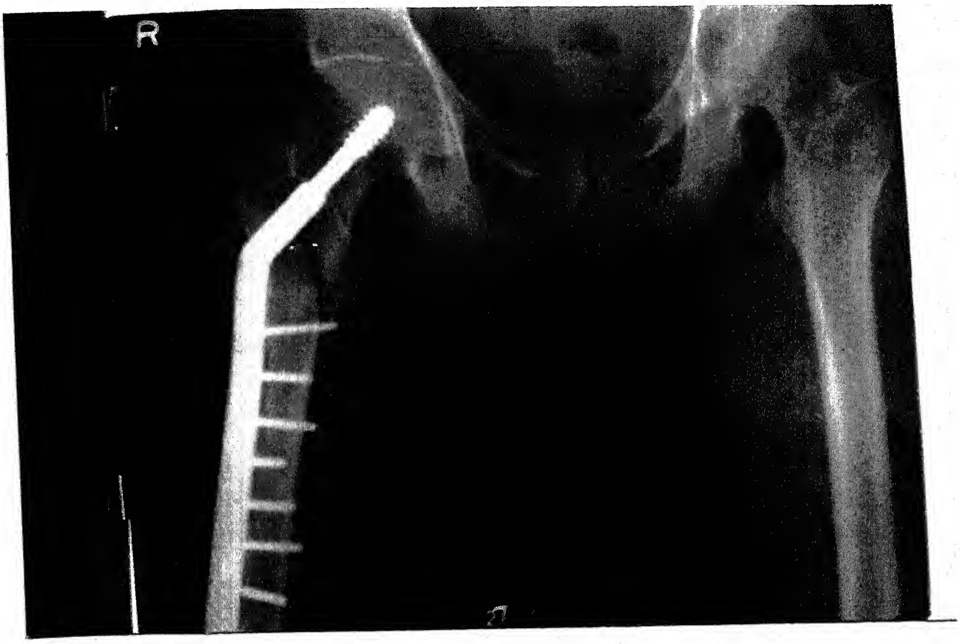
Final Photograph after Fracture healing

Photograph showing Patient in Squatting Position

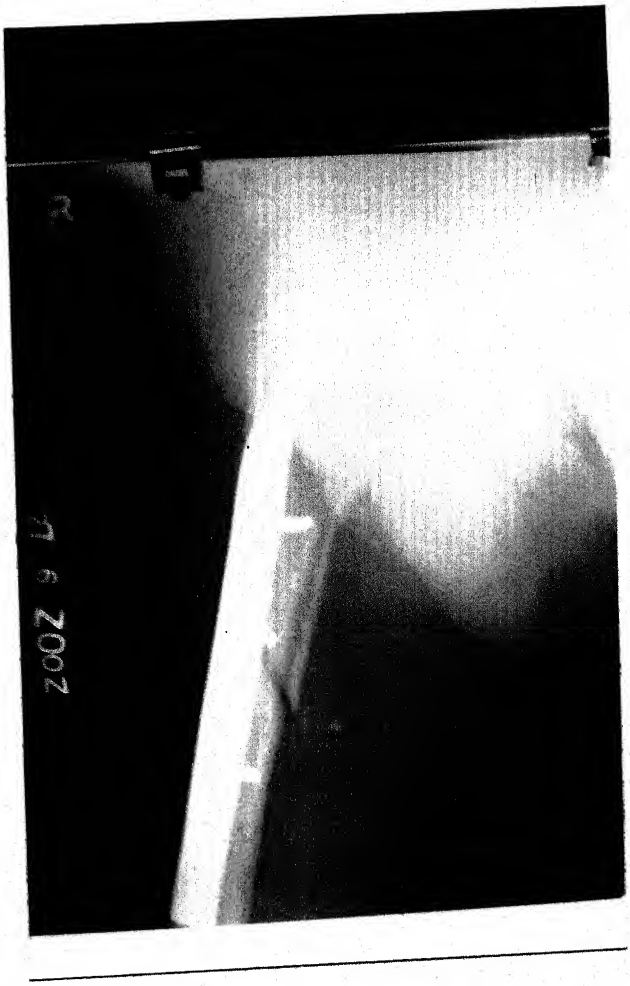


Photograph showing Patient in cross legged Position

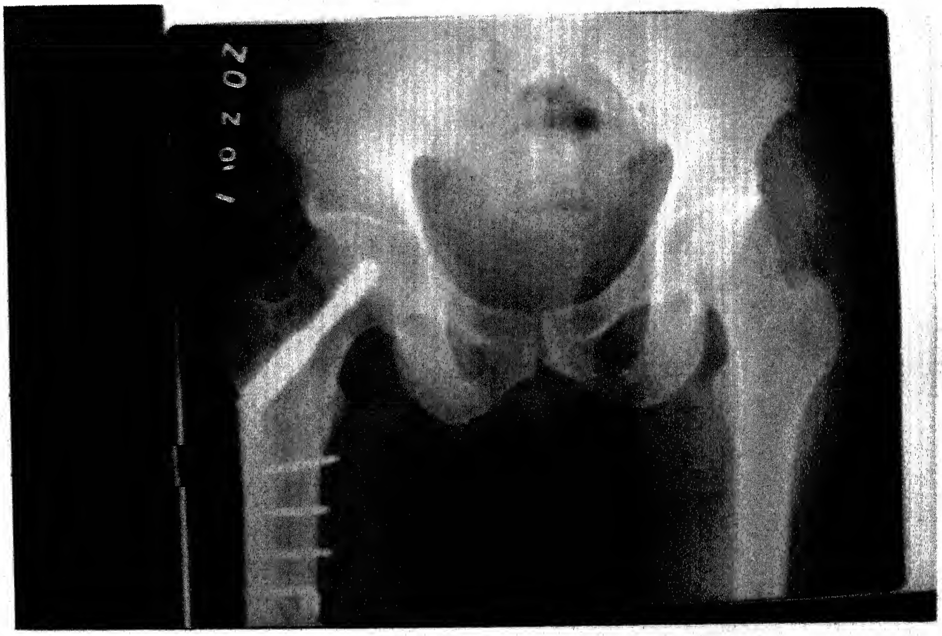
Pre – operation Radiographs



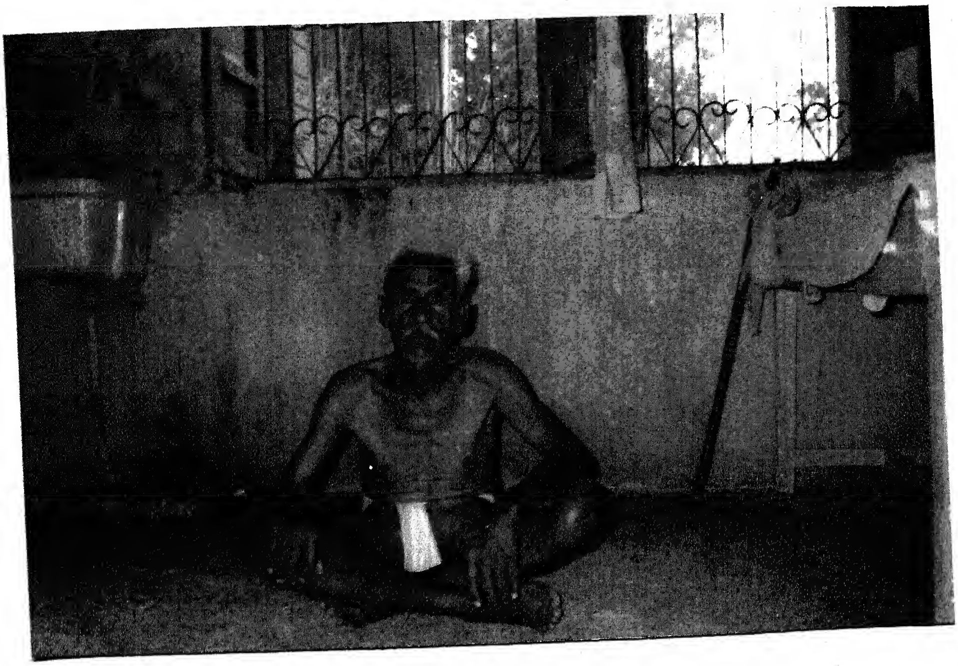
• Anteroposterior View



• Lateral View



Final Photograph after Fracture healing



Photograph showing Patient in cross legged Position

Photograph showing Patient in Squatting Position

DISCUSSION

DISCUSSION

The present series consisted of 20 cases of extra capsular fracture of femur treated in the department of orthopaedics, M.L.B. Medical College, Hospital, Jhansi.

Extra capsular fracture of femur was most common in age group of 61-80 years in present series with mean age of 57.25 years. Fractures were common in younger age groups in males, possibly because of outdoor activity, thus exposed more for trauma, and while in female fracture were common in older age group, which may be due to added risk of hormonal changes like postmenopausal osteoporosis of bone.

Average age reported by others workers is given below :

Name of the worker	Age in years
Cleaveland and Thompson, 1947	76.0
Boyd and Griffin, 1949	69.7
Evans, 1951 - Male	62.6
- Females	74.3
Gupta, R.C, 1974	51.2
Mulholland and Gunn, 1972	66-76
Present series, 2003	57.25

Thus average age in this series is nearly the same as presented by other Indian workers (Gupta, R.C, 1974) and is a decade lower than the authors of western countries. This discrepancy probably occurred due to the fact that the average life expectancy in our country is quite less than that of western world.

The ratios of male to female in our series were 3:2.

Ratio of males : females in other series is given below :

Series	Male	Females
Boyd and Griffin, 1949	74	226
Murray and Frew, 1949	56	46
Clawson, 1957	75	102
Clawson, 1964	1:2 to 8 (M:F)	
Gupta, R.C. 1974	106	64
Present study, 2003	12	8

The higher incidence of males in our study are in concurrence with the observation made by Gupta (1974) and another western worker Murray and Frew (1949) where as other western worker quote a higher incidence of females as compared to males.

We observed that the extra capsular fractures were slightly more common on right side as compared to left, ratio being 3:2 the preponderance of the right side had also been reported in a similar study by Gupta (1974).

Majority of the cases 65% reported for treatment on day of injury while 25% of cases reported within one week of injury, & the rest 10% took more than 1 week to report.

Considering the mode of injury in our series, out of 20 cases, injury due to slip on floor accounted for 50% of cases and road traffic accidents accounted for 40% cases & rest 10% were due to fall from height. The distribution was somewhat different to the series of cases reported by Clawson (1964) in which injury as a result of slip on floor, involving both direct and indirect forces accounted almost invariably in majority of cases.

This is probably due to more number of males at a younger age group in our study who are more exposed for road traffic accident. Sedentary workers (50%) usually sustained injury due to slipping on floor (50%) where as in moderate and heavy workers road traffic accident and fall from height was the major cause. This distribution was somewhat similar to series of cases reported by Shaftan (1967).

While observing the type of fracture in our series it was found that unstable fractures constituted 80% of all cases. This correlates with the finding of Jacobs and coworkers (1980) that incidence of comminuted unstable intertrochanteric fractures in increasing.

We agree to, Jensen et al (1980)who recommended the need for urgent internal fixation of an intertrochanteric fracture and avoiding any unnecessary delays so as to minimize the hazards of recumbency and difficulty in fracture reduction, but in our series only 25% of cases were operated within first week of injury, 45% of the patients were operated between one to two weeks of injury, and the rest 30% were operated in more than two weeks after injury, as this being a government hospital with increased patient load and less O.T. days for surgery.

In present study average hospital stay was 24.55 days. Average period of hospital stay reported by other workers is given below :

Name of worker	Hospital stay
Cleaveland et al, 1947	14 weeks
Evans, 1951	15 weeks
Clawsons, 1957	3.3 months

Gupta, R.C, 1974	36 days
Present study, 2003	24.55 days

Anatomical reduction was done in most (90%) of the patients. But in cases of comminuted fractures in which anatomical reduction could not be attained (10%), medial displacement of major distal fragment was done and spike of main proximal fragment was inserted into the distal fragment thus non anatomical but stable fixation was achieved.

In our series fracturë united in all patients, no patient showed sign of non-union. Most of the fractures were united between 12-20 weeks. Union was early in cases where fracture was of stable type & where the medialisation of distal fragment was done. Union rates vary from 70-90% in various series reported in the literature (Gupta et al, 1974).

In our study 20 cases were treated by internal fixation with dynamic hip screw. There were no complications in 70% cases. Only two cases 10% developed superficial infection which was treated with appropriate antibiotics, none of the patient developed deep infection. Only one patient (5%) developed U.T.I, must be because he was catheterized for prolonged period.

The infection rates reported by other workers are as follow :

Name of workers	Deep Infection rate (%)
Schumpelick et al, 1955	15.0
Jacobs et al, 1980	4.0
Jensen et al, 1988	2.0
Sernbo, et al, 1933	2.5

Sethi, T.S, 1993	8.0
Present study, 2003	0.0

In present study, 10% patients developed shortening of less than 2 cm while one patient (7.1%) developed shortening more than 2 cm. The incidence of shortening reported by various authors is as follow :

Name of authors	Shortening >2cm (%)
Juluro et al, 1975	7.5
Ecker et al, 1975	20.0
Heyse et al, 1983	14.0
Babhulkar, 1984	9.0
Sernbo et al, 1988	20.0
Sethi et al, 1993	28.0
Present study, 2003	5%

Only one patient (5%) developed lag screw cutout. This was the only major complication encountered out of 20 patients. There was no complication due to implant failure. Pressure sore, pneumonia did not developed in any case.

Wolfgang et al, (1983) reported that in their series, fixation with dynamic hip screw had 10% mechanical failure rate even after obtaining bony stability. In our study there was no case of implant failure.

In this series, mortality rate was zero. The mortality rate reported by various workers is as follow :

Name of worker	Mortality
Tage Sahltrand, 1974	24.0
Juluro et al, 1975	32.0
Kulkarni, 1980	11.5
Sethi, T.S, 1993	4.1
Present study, 2003	0.0

The low mortality rate reported by Sethi et al. (1993) and in present study is probably due to improved surgical techniques, better anaesthetic understanding, younger age of patient & relatively small sample of patients for study.

As one patient was lost in follow up after 3 months, the final results were evaluated for 19 patients and graded as excellent, good and poor as per criteria of Kyle (1979).

Excellent : No pain, minimum limp, normal range of motion, can walk without support, can squat and sit cross legged, no shortening.

Good : Occasional mild pain, noticeable limp, acceptable range of motion, can walk with the help of cane, can squat and sit cross legged, shortening less than 2cm.

Poor : Moderate pain, marked limp, limited range of motion, can't walk, can't squat and sit cross legged, shortening more than 2cm.

Using above criteria we achieved excellent results in 84.25% cases, good results in 10.5% cases and poor results in 5.25% cases.

Our observation are little better than with most of the workers.

Name of author	Excellent (%)	Good (%)
Tage Sahltrand, 1974	72.0	31.4
Babhulkar, 1987	59.0	33.0
Sernbo et al, 1988	82.0	18.0
Sethi, T.S, et al, 1993	72.0	18.0
Present study, 2003	84.25	10.5

In the present series one patient 5% developed external rotation deformity i.e., the same patient with lag screw cut out and none of patient developed adduction or internal rotation deformity. Adduction deformity reported by other workers is as follow :

Name of worker	Treatment	Deformity(%)
Boyd and Griffin, 1949	Conservative	31.4
Evans, 1951	Conservative	21.0
Clawson, 1957	Operative	40.0
Wade and Campbell, 1959	Operative	31.0
Horn and Wang, 1964	Conservative	40.0
Gupta, 1974	Operative	31.2
Present study, 2003	Operative	00

Thus, it is clear from this study that internal fixation is treatment of choice for intertrochanteric fractures of femur, as it eliminates the complications of recumbency in older age group.

CONCLUSION

CONCLUSION

The present study was conducted on 20 patients admitted in Orthopaedic ward of M.L.B. Medical College Jhansi during the year December 2001 to August 2003. Open reduction and internal fixation of the extra capsular fractures of femur with DHS plate is being practiced for number of years. DHS plate for rigid internal fixation of intertrochanteric fracture has reduced the morbidity and mortality and helps in early mobilizations of the patient. Its sliding feature and blunt ends reduce the acetabular penetration and help to transfer the weight bearing forces to bone rather than implant itself.

Its availability in wide range of size, of plate & lag screw provides the greater feasibility of the DHS in different intertrochanteric fractures.

Although the number of cases included in this study was less and the period of follow up was short, the results were quite comparable or even better to previous studies described in the literature.

The following conclusions were drawn from the study.

1. Intertrochanteric fractures are most common in patients of 61 to 80 years of age group with slightly higher male to female ratio.
2. Injury due to slip on floor 50% & road traffic accidents (40%) are the most common cause of trauma resulting in an intertrochanteric fracture of the femur.
3. Most of the patients are elderly dependents classified under sedentary workers.

4. Intertrochanteric fractures are found with almost equal frequency on both the sides with a slight right sided preponderance.
5. Most of the patients (80%) who require surgery are of the class III & IV of Boyd & Griffin. Only 20% are Type I & II.
6. Even the associated illnesses like D.M, H.T Hepatitis B., are not the contraindications for surgery if they are managed properly before surgery.
7. Approximately 30% of patients have associated injury to some other part of body.
8. Most of the cases of intertrochanteric fracture present within one week of injury, to the hospital.
9. Average hospital stay required for surgery is approximately 25 days.
10. A proper preoperative assessment and planning, thorough knowledge of operative technique, and well equipped operation theatre (image intensifier or in the absence of it X-ray control for A-P and lateral roentgenograms) are necessary to avoid complications.
11. DHS plate fixation is most suitable device for both stable and unstable trochanteric fracture.
12. DHS plate fixation is very useful to ambulate the patients of intertrochanteric fractures to avoid the hazards of recumbency.
13. When stable and rigid fixation is achieved and the patient is educated, post operative knee and hip movement and assisted weight bearing can be started as soon as pain permits.

14. Average time required for radiological union is 14-16 weeks.
15. The complications are negligible, major complications such as a lag screw cutout or implant failure are mainly due to faulty technique.
16. All the cases of –
    - Unstable intertrochanteric or sub trochanteric fractures.
    - Comminuted intertrochanteric fractures
    - Stable, oblique, and undisplaced intertrochanteric fractures above the age of 60 yrs should be internally fixed with Dynamic hip screws.

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MASTER CHART

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S. No	Name (Initials)	Age	Sex	Side of Limb	Mode of Injury	Occupation	Fracture pattern	Associated injury
1.	S K	40 Yrs.	M	Rt.	Road traffic accident	Heavy worker	Unstable	Fracture surgical neck humerus right side
2.	P.D.S	35 Yrs.	M	Lt.	Road traffic accident	Moderate worker	Unstable	Lacerated wound over knee, leg, ankle
3.	S G	65 Yrs.	F	Rt.	Slip on floor	Sedentary worker	Unstable	-
4.	S S	56 Yrs.	M	Rt.	Road traffic accident	Moderate worker	Unstable	Fracture ribs 6^{th} 7^{th} right side
5.	T P	75 Yrs.	M	Rt.	Slip on floor	Sedentary worker	Stable	-
6.	P B	75 Yrs.	F	Lt.	Slip on floor	Sedentary worker	Unstable	-
7.	M S Y	80 Yrs.	M	Rt.	Road traffic accident	Sedentary worker	Unstable	-
8.	C K	45 Yrs.	F	Lt.	Road traffic accident	Moderate worker	Unstable	-
9.	H B	63 Yrs.	F	Rt.	Slip on floor	Sedentary worker	Unstable	-
10.	J R	70 Yrs.	F	Lt.	Slip on floor	Sedentary worker	Unstable	
11.	T D	75 Yrs.	F	Lt.	Slip on floor	Sedentary worker	Stable	Fracture lower end radius (lt.)
12.	R R	50 Yrs.	F	Rt.	Slip on floor	Moderate worker	Unstable	-
13.	R K	19 Yrs.	M	Rt.	Road traffic accident	Heavy worker	Unstable	Facial laceration
14.	R N S	45 Yrs.	M	Lt.	Fall from height	Heavy worker	Unstable	-
15.	S D	95 Yrs.	F	Lt.	Slip on floor	Sedentary worker	Stable	-
16.	H K	84 Yrs.	M	Rt.	Slip on floor	Sedentary worker	Stable	-
17.	R S	35 Yrs.	M	Lt..	Fall from height	Heavy worker	Unstable	Intra articular fracture lower end radius (lt)
18.	LS	73 Yrs.	M	Rt.	Slip on floor	Sedentary worker	Unstable	-
19.	D K	40 Yrs.	M	Rt.	Road traffic accident	Heavy worker	Unstable	-
20.	P Y	25 Yrs.	M	Rt.	Road traffic accident	Heavy worker	Unstable	-

Contd.

S. No.	Associated illness	Duration between injury & admission (days)	Duration between injury & operation (days)	Anaesthesia	Duration of Hospital stay (days)	Patient evaluation after six months (Kyle's Criteria)		
						Pain	Limp	Ability to squat & sit crossed legged
1.	-	<1	4	Spinal	18	Absent	Absent	Present
2.	-	<1	34	Epidural	48	Moderate	Marked	Absent
3.	Hypertension	3	13	Spinal	24	Absent	Absent	Present
4.		1	20	Spinal	33	Absent	Absent	Present
5.	Hypertension Diabetes	<1	8	Spinal	22	Absent	Absent	Present
6.	-	<1	17	Spinal	31	Absent	Absent	Present
7.	COPD	<1	13	Spinal	27	Mild	Noticeable	Present
8.	-	<1	17	Spinal	31	Absent	Absent	Present
9.	-	<1	6	Spinal	20	Absent	Absent	Present
10.	-	2	21	Spinal	32	Absent	Absent	Present
11.	-	<1	6	Spinal	20	Absent	Absent	Present
12.	Hepatitis	9	13	Spinal	18	Absent	Absent	Present
13.	-	<1	4	Spinal	18	Absent	Absent	Present
14.	-	22	26	Spinal	18	Absent	Absent	Present
15.	-	2	13	Spinal	25	Absent	Absent	Present
16.	COPD	<1	12	Spinal	26	*	*	*
17.	-	<1	6	Spinal	20	Absent	Absent	Present
18.	-	4	10	Spinal	20	Mild	Noticeable	Present
19.	-	<1	8	Spinal	22	Absent	Absent	Present
20.	-	<1	4	Spinal	18	Absent	Absent	Present

Contd.

* Patient lost to follow after three months

S. No.	Patient evaluation after six months (Kyle's Criteria)			Superficial wound Infection	Deep wound Infection	Deep vein Thrombosis	Bed Sores	Shock	U.T.I	Cardiac failure
	Ability to walk with or without support	Range of motion of hip & knee	Shortening							
1.	Present	Normal	Absent	-	-	-	-	-	-	-
2.	Absent	Limited	> 2cm	-	-	-	-	-	-	-
3.	Present	Normal	Absent	-	-	-	-	-	Present	-
4.	Present	Normal	Absent	-	-	-	-	-	-	-
5.	Present	Normal	Absent	-	-	-	-	-	-	-
6.	Present	Normal	Absent	-	-	-	-	-	-	-
7.	Present	Acceptable	< 2cm	-	-	-	-	-	-	-
8.	Present	Normal	Absent	-	-	-	-	-	-	-
9.	Present	Normal	Absent	-	-	-	-	-	-	-
10.	Present	Normal	Absent	-	-	-	-	-	-	-
11.	Present	Normal	Absent	-	-	-	-	-	-	-
12.	Present	Normal	Absent	-	-	-	-	-	-	-
13.	Present	Normal	Absent	-	-	-	-	-	-	-
14.	Present	Normal	Absent	-	-	-	-	-	-	-
15.	Present	Normal	Absent	Present	-	-	-	-	-	-
16.	*	*	*	Present	-	-	-	-	-	-
17.	Present	Normal	Absent	-	-	-	-	-	-	-
18.	Present	Acceptable	< 2cm	-	-	-	-	-	-	-
19.	Present	Normal	Absent	-	-	-	-	-	-	-
20.	Present	Normal	Absent	-	-	-	-	-	-	-

Contd.

* Patient lost to follow after three months

S. No.	Cutting of Lag Screw	Implant failure/Bending or breaking of screw	Knee Stiffness	Coax vara	Non Union	Shortening
1.	-	-	-	-	-	-
2.	-	-	-	-	-	> 2cm
3.	-	-	-	-	-	-
4.	-	-	-	-	-	-
5.	-	-	-	-	-	-
6.	-	-	-	-	-	-
7.	-	-	-	-	-	< 2cm
8.	-	-	-	-	-	-
9.	-	-	-	-	-	-
10.	-	-	-	-	-	-
11.	-	-	-	-	-	-
12.	-	-	-	-	-	-
13.	-	-	-	-	-	-
14.	-	-	-	-	-	-
15.	-	-	-	-	-	-
16.	-	-	-	-	-	*
17.	-	-	-	-	-	-
18.	-	-	-	-	-	< 2cm
19.	-	-	-	-	-	-
20.	-	-	-	-	-	-

* Patient lost to follow after three months